MADRAS FISHERIES DEPARTMENT.

THE INDIAN BÊCHE-DE-MER INDUSTRY:

ITS HISTORY AND RECENT REVIVAL

BY

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Bêche-de-mer, also known widely as *trepang*, is the commercial name of a marine food product held in great esteem among the Chinese. It consists of the dried body-wall of certain species of large Holothurians, a group of animals known popularly in England as sea-cucumbers owing to their characteristic cylindrical or sausage-like shape, and intimately related to sea-urchins and starfishes in spite of the great dissimilarity in outward form. Hence the group belongs to that assemblage of animals known zoologically as Echinodermata.

The term *bêche-de-mer* is the French rendering of the Portuguese name *bicho-do-mar*, signifying sea-slug; in Tamil it is known as *attai* or leech, this being more familiar to Indians than the slug.

HISTORY OF THE TRADE IN INDIA.

The cured product has been from time immemorial a valued Chinese delicacy; strangely enough appreciation of its flavour has never spread to the epicures of other races, and all but an infinitesimal amount of the total production is consumed by the Chinese at home and abroad. In its quest the Chinaman has penetrated alike to the shores of Southern India and to the lagoons of Polynesia, and from Japan in the north to Australia in the south he has pioneered the trade and introduced appropriate curing methods. We know that the Chinese had constant trade with Southern India and with Ceylon a full thousand years ago, maintained by junks of large size and fine equipment; so numerous and large were the vessels of their trading fleet that on one occasion it transported a Chinese army to Ceylon which defeated the Sinhalese

and captured the King.[1] With traffic maintained by means of the annual trade fleet it may be presumed with tolerable certainty that bêche-de-mer as well as pearls figured among the Indian products received at the Pandyan port of Kayal in exchange for the porcelain, silks, and sweetmeats of the Middle Kingdom. Coming to British days the earliest definite reference to the trade which I have found is an offer to Government made in 1816 by a certain Mr. Wilkins for the whole of the bêche-de-mer fished off Mannar in Ceylon.[2] Doubtless the Dutch records in India and Ceylon contain more definite information, but these are not readily available to me.

Tradition affirms that formerly the trade was much greater than at present and the statistics supplied by the Customs Department bear this out generally as will be seen from the table given opposite.

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[1] The Sinhalese chronicle *Rajawaliya*, gives the date as 1958 of the Buddhist era, equivalent to 1415 A.D.

[2] Boake, W.J.S., "Mannar, a monograph," p. 52, Colombo, 1888.

STATISTICS of the imports and exports of Bêche-de-mer for the Madras Presidency from 1898 to 1916 as shown by the customs returns.

Year.	Exports from Madras Presidency.								Imports into Madras Presidency.				Remarks.
	To Straits Settlements.				To Ceylon.				From Ceylon.		From Straits Settlements.		
	Foreign Produce.		Indian Produce.		Foreign Produce.		Indian Produce.						
	Weight in lb.	Value in rupees.	Weight in lb.	Value in rupees.	Weight in lb.	Value in rupees.	Weight in lb.	Value in rupees	Weight in lb.	Value in rupees.	Weight in lb.	Value in rupees.	
1898–1899 ...	...	...	56,896	15,380	...		...	...	16,639	7,428	...	...	The imports from Ceylon in 1898–99 appear to have been re-exported as Indian produce.
1899–1900	8,232	2,940	3,192	1,140	...	...	...		19,995	8,227	..	..	The Indian produce exported during these years is wrongly classed as foreign produce being lumped with Ceylon re-exports (J.H.).
1900–1901 ...	...	...	...	...	..			...	10,976	4,798	...	...	
1901–1902 ...	22,176	9,045	...	...	4,368	1,560	...	...	30,491	12,773	...	...	
1902–1903 ...	13,888	7,340	...	...	22,512	10,050	...		21,700	7,745		...	
1903–1904 ..	19,824	9,743	..	...	...	...	13,272	4,740	17,416	7,340	...		
1904–1905 ...	336	120	32,284	15,203	...	...	...	...	13,272	4,740	.	...	The converse has happened here, all the exports from Ceylon being classed as Indian produce upon re-export (J.H.).
1905–1906 ...	...	..	68,544	24,300	...	.			18,080	3,460	56	5	
1906–1907 ...		...	6,944	3,100	...	..	29,568	9,660	...		...	...	
1907–1908	...	...	22,204	8,460	...	...	..	...	36,949	7,979	...		
1908–1909 ...	...	...	28,352	7,020	...	...	. .	...	28,933	5,213	...	..	
1909–1910 ...	...	...	18,732	5,039	..	...	...	...	10,720	1,477		.	
1910–1911 ...	...	...	2,716	655	...	..	...	...	...	...	...	...	
1911–1912 ...	.	...	6,272	800	...	...	...	...	..	..	...	...	
1912–1913 .	...	...	1,120	596	...	...		...	...	...	...	..	
1913–1914 ...	...	...	3,024	600	...	...	...	..		...	...	...	
1914–1915 .	...	...	...	...	...	..	...	...	...	. .	...	...	
1915–1916 ...	...	...	4,816	1,426	...	...	...		..		...	...	
Total ...	64,456	29,188	255,096	83,719	26,880	11,610	42,840	14,400	225,171	71,180	56	5	

In this table considerable confusion exists however and the value of the statistics is discounted by very obvious errors in the statement of the country of origin of the goods exported. From these returns it is seen that prior to 1910-11 a large proportion of the Ceylon produce was sent to India for re-export to China, but in almost all cases exporters have failed to classify properly the goods shipped from India. Thus from 1901-02 to 1903-04, the whole export was described as "Foreign produce," whereas from 1904-05 to 1909-10 inclusive the imported Ceylon produce has been lumped with the home produce as "Indian produce"; in the latter period of six years 107,954 lb. weight was imported into India from Ceylon, but the Customs tables show only 336 lb. of foreign produce exported from India, an evident absurdity, seeing that not an ounce of this material is consumed in India. The missing 107,618 lb. have been undoubtedly included in the exports of 206,628 lb. of so-called Indian produce shown by the Customs tables. We are consequently unable to ascertain the actual annual production and export of the Indian-cured product during the years 1898—1910. Only from 1910 have we accurate annual data as no Ceylon produce has been imported (for re-export) into India since that year. Without the above explanation the Customs returns prior to 1910 give an altogether misleading record of the condition of this trade, one more instance of the unsatisfactory nature of such statistics when not prepared and checked by trade experts.

The only useful result we can arrive at by analysis is to note that the total exports (including re-exports) from India for the twelve years from 1898 amounted to 371,324 lb.; deducting the total imports for this period of 225,227 lb. we get a balance, representing approximately the actual Indian home production of 146,097 lb. giving an average of 12,175 lb. per annum for the twelve years in question. Since 1910 the annual Indian export has diminished to 2,991 lb., a very great falling off.

The knowledge of this great diminution in the production coupled with information obtained in 1915 that the local merchants were suspending their operations, owing partly to difficulties and uncertainties induced by war conditions, and partly by alleged reduction in the wholesale rates ruling in the Straits—Penang being the port to which the local merchants usually ship their goods—caused me to undertake an enquiry into the condition and

prospects of the industry. The result, while confirming the exporters' statements of poor prices prevailing for their goods, revealed the fact that the main reason lay in a deterioration in quality, due to a fault very prevalent I am sorry to say among Indian manufacturers, to wit, the scamping of essential processes in over-eagerness for immediate large profit and in a gradual deviation from the original methods of preparation introduced by Chinese curers. The history of the trade so far as I can see is one of definite fluctuations. First comes a Chinese merchant-curer who establishes a curing-station on the Palk Bay coast of the Ramnad district, engages labour and buys the raw product from the local divers. He works conscientiously in Chinese fashion, giving constant supervision and insisting on approved methods being followed, and, where need be, improving upon them. His product is first-class, obtains good prices in Penang, Singapore or China, and he begins to wax prosperous and extend his enterprise. Here after a few years enters the Muhammadan merchant of Kilakarai; he has watched the Chinaman develop (or revive the trade), has obtained knowledge of the curing methods pursued and the general course of the trade, and forthwith determines to oust the Chinaman and appropriate his business. So the next season the Chinaman finds a rival curing-station opened; he finds his trade gone in a day and has no alternative but to seek some other stage for the exercise of his talents. But why, it may be asked, does he give in without a struggle? Why! because his rival has such effective methods of influencing the divers of the local coast villages that an outlander has no chance. The divers are probably already heavily in debt to this merchant or to one of his relatives or friends for advances made for work in the Chank Fishery which is usually carried on concurrently with the bêche-de-mer fishery, and a gentle turn of the debt-screw is all that is necessary to enforce compliance with any boycott that may be ordered against the stanger. Upon the departure of the Chinese curer, the curing staff, being the same men as he employed, carry on according to his methods and all goes well for a few years. Then little by little carelessness and deviation in detail creep into the conduct of the work and deterioration in the quality of the product begins to be found by the Chinese buyers in the consignments received. The Indian product falls in estimation and eventually into such bad odour (figuratively and actually) that the

prices given prove unremunerative to the Indian exporter and the trade dies out or languishes. Then after a longer or shorter period another Chinese curer appears on the scene who revives the trade and sets it on its feet again by the employment of honest and careful methods.

The last time a Chinaman operated on the Ramnad coast was some 30 years ago according to my informants. He passed duly through the experience I have outlined above and the trade had reached its ebb in 1916 when I came on the scene as a variant of the periodical Chinaman. I had already some knowledge of the curing processes and I was soon in a position to put my finger upon the irregularities which had caused the Indian product to become unsaleable at remunerative prices. Before enumerating these I shall furnish some details of the species esteemed and of the approved methods evolved by Chinese curers for the proper preparation of the Indian raw material.

THE CHIEF SPECIES CURED.

The only species of Holothurian found by the Chinese suitable and sufficiently abundant for conversion into bêche-de-mer on the Ramnad coast is the one known locally as *vellai attai* or white bêche-de-mer. This I have identified as the species known to zoologists as *Holothuria scabra,* Jaeger. It grows to a large size, often 12 to 15 inches long, with a girth of 6 to 7 inches. Although nearly cylindrical, there is a slight flattening of the side upon which it lies habitually, and this part is snowy white dotted with many minute black specks; the upper side or back is crossed by irregular light bands and bars—white, pale-yellow, or grey—outlined in dark grey upon a ground colour of paler grey. In its skin are enormous numbers of minute limy spicules scarcely visible when extracted even as very fine dust except with the aid of the microscope. The only other species sufficiently abundant to be commercially dealt with are the "green prickly-fish" (*mul attai,* i.e., thorn-attai) and the "black-fish." The latter is very numerous on the reef-flats of the coral islands along the Ramnad and Tinnevelly coast, but owing to the thinness of its body-wall it shrinks so greatly in curing as to be difficult to handle commercially, particularly as its intrinsic value is very low even when sold by weight. This species I identify as *Holothuria atra,* Jaeger, while the "green prickly-fish" is the well-known *Stichopus chloronotus,*

Brandt. It is not so abundant as either the white or the black species but is fairly common on weedy bottom in Rameswaram bay. It has no present commercial value, owing to the gelatinous nature of the body-wall, which dissolves into a glutinous mass soon after death.

Saville-Kent in *The Great Barrier Reef of Australia*, page 239, has suggested that this and other similar soft-bodied species might possibly be susceptible of cure if placed in strong brine or other astringent immediately after capture. Experiments have recently been made in this direction at Rameswaram, and I am able to report that I have found it possible to carry the material successfully through the boiling process. Unfortunately this does not help, for the subsequent dryage reduces even large animals to microscopic proportions. The final verdict confirms the current opinion that this species has no commercial value. Curiously enough, the most valued of the Australian species of bêche-de-mer is the closely allied "red prickly-fish" (*Stichopus variegatus*, Semper), with a market value that once varied between £130 to £150 (Rs. 1,950 to Rs. 2,250) per ton.

With the white bêche-de-mer fished off the Ramnad coast are a very few "red-fish" (*Holothuria spinifera*, Theel). This is mixed with the former in curing. Its quality and appearance are first-class and were it obtainable in quantity and could be sold separately, it would fetch a much higher price than the "white-fish."

THE CHINESE CURE OF THE INDIAN WHITE BÊCHE-DE-MER.

For practical purposes *Holothuria scabra*, otherwise *vellai attai* or white bêche-de-mer, is the only Indian species that counts in the eyes of the Chinese curers, as being both abundant and capable of being converted into a satisfactory product. It appears however not to be a species in any esteem in the Malay Archipelago where it also occurs and where other species monopolise commercial attention.[1] The reason is that it requires special methods of cure and these appear to have been evolved and practised only in India, as already mentioned. This species has an enormous abundance of limy spicules in its skin and unless these be removed the product when dried appears as if caked with chalk; indeed it is to all

[1] It is not recorded by Saville-Kent in his list of Australian species unless it be his *Holothuria edulis*. (*Great Barrier Reef of Australia*, London, 1893.)

intents a chalky coat as it consists wholly of calcareous spicules. In other countries the coating being left on the product renders it of very low market value. Saville-Kent (*loc. cit.*, page 233) says of the Australian "sand-fish" (his *Holothuria fusco-cinerea*, *H. edulis* and *H. impatiens*) that in these this chalky coat is so abundantly developed that it is possible to utilize the dried bodies, like chalk, for marking purposes. He adds that when mixing these "sand-fish" with other more valuable species the subterfuge is not infrequently resorted to of dyeing their bodies a deep red-brown in a decoction of the bark of the red mangrove, *Rhizophora mucronata*. Thus treated they are not easily detected, when mixed in bulk, from the poorer descriptions of ordinary red-fish.

It is one of these disparaged species with which we have to deal in India; the following is the method of preparation as worked out by the Chinese curers:—The animals as soon as possible after they are brought to the curing station are heaped up in shallow cauldrons supported on mud walls over fires fed with leaf-butts of palmyra leaves. No water is added as it is found the animals expel a sufficiency from within their bodies as they feel the heat and contract. A furious fire is kept going and in about fifty minutes the animals have shrunk to about one-half their original length and have begun to give out a distinctive cooked odour. At this stage they are removed and buried in a shallow pit dug in the sand close to the water's edge. Sand is heaped over and a plentiful amount of sea-water thrown on the sand in order that the buried material may be kept moist and run no risk of drying up. Here the bêche-de-mer remains usually 12 to 18 hours or even more according to size. When judged sufficiently "ripe," the bodies are disinterred and removed to a large basket about 2½ feet in depth by about the same diameter. As they are lifted one by one the curer's thumb is run over the surface, loosening and dislodging much of the chalky encrustation. If the material has not been buried sufficiently long, this coat adheres too strongly and will not yield a satisfactory result when dried. As soon as the basket is half filled a curer jumps in and proceeds to tramp upon the filthy-looking mass, the while an assistant pours in successive bucketsful of sea-water. If the period of burial has been judged aright, the surface layer containing the chalky spicules is sufficiently decomposed to peel off readily and leave the underlying thick connective tissue layers free from the original chalky deposit. After a final

rinse the cleaned product is put a second time into the boilers with enough sea-water to cover it and once again brought to boiling point. Thereafter it is laid out on mats and either dried wholly in the sun, or after partial drying it may be transferred to a very primitive and wasteful form of smoke-house and dried to completion over wood smoke. I should here mention that evisceration is effected naturally, the animals doing so after the approved Holothurian fashion through the vent, either when lying on the beach awaiting the curer's attention or when heated *en masse* in the boiler. No slitting open of the body is practised or needful.

Now this is not the method in use in Australia and Malaysia. There the process as described by Saville-Kent (*loc. cit.*, page 226) is as follows:—

"Immediately on their arrival at the depot or curing station, they are placed in large iron cauldrons and boiled for twenty minutes. They are next taken out; split up longitudinally with a long, sharp-pointed knife; gutted; and exposed on the ground in the sun until the greater portion of the moisture has evaporated. The largest specimens, such as prickly and teat-fish, are frequently spread-open, so as to dry more readily, with small transversly-inserted wooden splints. The greater amount of moisture having been got rid of, the fish are transferred to the smoke-house. This is usually composed of corrugated iron 10 or 12 feet high and fitted in its upper half with two or three tiers of wire netting upon which the bêche-de-mer are laid. The wood most in favour for the smoking process is that of the red mangrove. Twenty-four hours is the usual period for which bêche-de-mer are left in the smoke-house. By the end of that time they have for the most part shrunk to a length of six inches or less, and in aspect they may be likened to charred sausages. They are then ready for bagging up and despatch to the nearest market."

The Chinese who evolved the method now practised in India, showed great resource in adapting their methods to the treatment of a refractory subject and rendering valuable a material which otherwise would have been unprofitable to fish and cure. As showing how local the practice of this ingenious method is and how unknown it is further east, we have not only Saville-Kent's account as quoted above, but also the following extract of a letter received by me this year (1917) from Mr. Alvin Seale, lately

Director of the Fisheries Section of the Bureau of Science, Philippine Islands :—

"In reading your interesting lecture on the Minor Marine Industries, I was greatly astonished by the method you gave for preparing bêche-de-mer. You state 'no water is added' (in boiling) 'as they contain sufficient fluid within their bodies. When removed from the pan they are placed within a basket and well tramped in order to remove their skin.'"

"Now I have seen thousands of commercial trepang but I never have seen one with the skin removed—none are prepared in the Philippines or in Japan, or in Australia in this way, as I have watched the process very carefully in these places. I have also prepared quite a quantity myself, so I would like a little more detail regarding your method."

It is probable therefore that with the further particulars which I have supplied and the publicity that will follow upon the publication of this report, that the Indian method of treatment will be adopted in other bêche-de-mer producing countries and so enable species hitherto considered valueless to become of importance in the trade, and so form a small contribution to the extension of the food resources of the East.

DEFECTS IN CURE AND TRADE IRREGULARITIES.

When I began the investigation of this product in 1914, I found that the perfected Chinese methods were not being followed with precision; the product in consequence was inferior in quality. Further, the curers and exporters had evolved several clever but shortsighted sharp practices in the sophistication of the product, with the idea partly to increase the weight illegitimately and partly to pass considerable quantities of inferior quality into bags containing better grades.

The chief of these departures from proper practice and honest work were :—

(*a*) Faulty evisceration,

(*b*) Imperfect removal of the chalky dermal coating,

(*c*) Careless drying, entailing a dirty-looking product, much coated with sand,

(*d*) Reluctance to smoke the product in order to save the expense of fuel,

(*e*) The mixing of improper quantities of small stuff with the larger grades, and

(*f*) Storage for long periods, entailing deterioration while waiting for a good market.

The first three were the most productive of harmful consequences, but taken all together the cumulative effects were so serious that the reputation of the Indian cure had fallen so low that prices in 1914 were so unsatisfactory that the Kilakarai curers virtually retired from the trade.

Improper evisceration was probably the most potent factor in the discredit of this trade. It was by no means the result of carelessness, but was a deliberate move to increase the final weight. The present species of Holothurian feeds almost in the same way as earthworms; it has a series of somewhat scoop-shaped tentacles arranged around the mouth which is near the front end of the body, but turned downwards for convenience in sucking up the sand with the assistance of the scooping action of the tentacles. For nutriment these creatures depend upon the live organisms or other organic matter contained in the sand ingested, such as diatoms, foraminifera, radiolaria, fragments of seaweed and the like. Hence the intestines are always crammed with sand and if these be not fully removed by natural or by forced evisceration, a considerable quantity of sand remains within the body, adding to the weight—a well-known trade device in other Indian trades besides this. The imperfect removal of the outer chalky coating was perhaps not done intentionally; probably it was the result of carelessness and lack of supervision. Anyway it also added to the final weight and the dodge was occasionally resorted to of putting some black Holothurians (*H. atra*) into the pan during the second boiling in order that the dark purplish pigment contained in their skin might stain the chalky encrustation and render it inconspicuous. Compare the parallel dodge mentioned by Saville-Kent (*loc. cit.*, p. 233) practised in Australia of dyeing the chalk-coated "sand-fish" with mangrove bark decoction.

Another common trade trick was to slit open large animals and insert small ones in the cavity within. In a country where labour is cheap, such a method may be practised with great profit for a limited time as the trick is not readily detected until the article comes finally into the cook's hands.

Another great mistake tending to give the product a bad reputation was reluctance to expend fuel upon smoking. The chief, if indeed it be not the sole *raison d'etre* for smoking is to sterilize the

product, partly by impregnation and partly by covering it with an antiseptic coating whereof the effective agent is creosote contained in the wood smoke. The importance of this operation as affecting the keeping qualities of the product is not properly appreciated by Indian curers; consequently in the desire to make a maximum of profit, they smoke the stuff only when compelled to do so by a continuance of rainy weather and then only in order to get the material dry. *They make the mistake of considering the smoke house as an artificial dryer* and not as a sterilizing chamber. They look on smoking as an expensive substitute for sun drying. This defect in itself would not be serious, as I have proved commercially, if frequent periodical examination of the stored material be made, if it be spread out in the sun whenever any dampness be apparent, and if it be shipped to its destination in frequent parcels immediately enough be accumulated. But this is not the business method of local merchants. They will not send small lots for sale at frequent intervals owing to the somewhat higher ratio of charges involved thereby; they prefer to accumulate comparatively large quantities and to sit on this indefinitely—even for several years—waiting for advice from their Penang correspondents of the advent of high prices. During this lengthy storage, in spite of the general dryness of the climate on the Ramnad coast, the material sooner or later absorbs moisture and in the congenial conditions of damp and darkness, fermentative micro-organisms establish themselves in the material and rapidly entail marked deterioration. I have seen long-stored material dissolving into a black glutinous mass. When this happens, the owner reboils the material, thereby arresting fermentation and temporarily sterilizing the mass. Each reboiling reduces the weight and impairs the outward appearance, as the fermented portions dissolve in boiling water and leave ugly abscess-like cavities, which must tell their tale quite plainly to expert buyers.

THE STORY OF THE GOVERNMENT EXPERIMENTAL FACTORY.

Consequent upon the conclusions come to from my preliminary investigation of the industry in 1914–15, I felt that here was an industry, brought to discredit and ruin by careless work and short-sighted trade trickery, whereto Government effort might with propriety be devoted with the three-fold aim of reviving a decadent local industry, of perfecting the methods hitherto employed, and

of providing additional remunerative employment to the chank divers of the Ramnad district.

Accordingly I outlined proposals for the establishment of an experimental factory to be located at Tirupalakudi, the chief settlement of chank divers on the Palk Bay coast of the Ramnad district. Government sanctioned the scheme in G.O. No. 2739, Revenue, dated 9th December 1915, and as soon after as circumstances allowed, I constructed a store and a boiling shed to accomodate three cauldrons. I also designed a special smoke-kiln to hold eight trays made of expanded metal, at appropriate intervals one above the other. On August 6, 1916, actual operations began, after settling the rates to be paid with the divers of the place. The latter were very pleased with the step thus taken, for it gave them an additional string to their bow; on certain parts of the ground where they fish chanks, bêche-de-mer are also found and although the price provisionally fixed was low in view of the uncertainty prevailing as to the eventual sale proceeds of the cured material, it was sufficiently remunerative to mean an appreciable and welcome addition to their earnings. Then on certain days when diving was not possible in the deep-water beds, the men were able to make a living wage by fishing specifically for the smaller sizes found in great abundance in certain shallow water areas. Usually a few chanks were also found in these inshore beds and these were an additional source of profit both to the men and to Government. They would have remained unfished had no bêche-de-mer fishery been started.

The methods previously in vogue, stripped of their more obvious defects, were employed during the first season's work. Great care was exercised in denuding the animals of their chalky coat, and scrupulous cleanliness was enforced, particularly in the drying process. Further, in place of permitting the boiled material to be dried on mats, laid on sandy and often dirty ground, drying platforms raised 2½ feet above the ground level were erected, and on these were spread expanded-iron trays whereon the material was laid to dry. By this simple device, the drying period was considerably shortened and the animals were kept clean and free from the adherence of sand and dirt. The product in consequence was improved greatly in appearance, being obviously brighter and cleaner than material prepared after the more primitive method.

The importance of complete evisceration was not fully appreciated during the first season's work and as a consequence a certain portion of the material was dried with considerable quantities of sand enclosed within the body walls ; this undoubtedly affected adversely the value to some extent when put upon the market. Even with this partial defect, local opinion was emphatic that the cure was a marked improvement upon the quality turned out of recent years by the Kilakarai curers. This opinion received confirmation from the comparatively high prices eventually realized. During the current season special means are being taken to do away entirely with this defect by means of a partial slitting open of the body-wall before boiling, whereby perfect evisceration is obtained. The dried weight will be considerably reduced, but I have little doubt that purchasers will appreciate this improvement by paying higher rates. That the produce of the Government factory may be readily recognizable, a special trade brand has been adopted, and it is hoped that this will soon come to be known as a guarantee of prime quality and so become an asset of considerable importance.

During the initial season's working only a small quantity of material was smoked as the kiln was not ready at the beginning. This had no adverse financial consequence, for the Singapore brokers reported that it so happened at the time of the consignement's arrival that the market was bare of unsmoked material and as this, when of good quality, is preferred for purely local consumption, excellent prices were obtained as the buyers found the consignment clean, well-dried and generally to their liking. From this it would appear that so long as the consignments are small there is no objection—sometimes even an advantage—in a proportion of the material being sun-dried if in good condition otherwise ; such supplies the local markets of the Malay Peninsula, whereas smoked material, owing to its better keeping quality, is more suitable for re-export to China. It follows therefore that as the Singapore home consumption is limited, the larger be the consignments and the more frequent they be, will necessitate a larger proportion being sent in the smoked condition.

A point the bêche-de-mer curer must note carefully is that the boiled body juice of the material is exceedingly corrosive in its effect upon metal ; hence the boilers must be most carefully emptied and rinsed out with clean water at the end of each day's

operation. Any boiled juice left overnight in the pans, if this happens frequently, will quickly eat into the iron and destroy the pan in a short time. For the same reason copper or brass vessels and utensils must be rigorously avoided. A case is on record where a copper pan being used as a boiler, the bêche-de-mer boiled in it took up so much copper salts that several deaths resulted from its consumption in China and the particular grade fell in market value enormously from the discredit that thereby attached to it.[1]

The total outturn weights of the material cured from August to October 1916 were as follows:—

Large and medium sizes (Nos. I and II) ...	1,997 lb.
Small (No. III), including smoked	799 ,,
Total ...	2,796 lb.

COSTS AND CHARGES.

To descend to exact financial particulars, the operations at Tirupalakudi during the three months from August to October 1916, which may be reckoned as the first half-season, entailed expenditure as follows:—

Capital expenditure:—

	RS.	A.	P.
Cost of temporary buildings	77	5	3
,, of pans, trays, utensils, etc. ...	55	10	0
Total capital expenditure ...	132	15	3

Running charges:—

	RS.	A.	P.
No. I quality, 493 animals at 2 pies each	5	2	2
No. II quality, 43,797 animals at 1 pie each	228	1	3
No. III quality, 36,016 animals at 3 for 1 pie ...	62	4	3
	295	7	8
Labour (curer's and assistant curer's wages, etc.) ..	79	3	2
Fuel	70	7	9
Sundries	31	12	10
Supervision (half of the chank gumastah's wages for 6 months)	60	0	0
Total running charges ...	536	15	5

[1] Saville-Kent, *loc. cit.*, p. 239.

In addition, freight, insurance, and shipping charges amounted to Rs. 51-12-6. Against the total cost and charges amounting thus to Rs. 588-11-11, exclusive of capital expenditure, we received net sale-proceeds of Rs. 1,074-12-9, giving an apparent profit of Rs. 486-0-10 upon the operations; from this however must be deducted depreciation on buildings and apparatus, say 50 per cent upon the capital expenditure of Rs. 132-15-3; this being Rs. 66-7-8, we get as a final net profit the sum of Rs. 419-9-2, equal to a little over 63 per cent on the expenditure, which must be considered very satisfactory in view of the comparatively small quantity of material treated. With larger quantities, the percentage of profit would be substantially increased.

The selling rates obtained in January 1917 were as follows, c.i.f. Singapore:—

Unsmoked:—

	Per picul.	Per ton.
Large and medium sizes (the Nos. I and II qualities of Indian trade).	\$36 (Rs. 60-5-0) =	Rs. 1,013-4-0 (= £67½).
Small size (the No. III quality of Indian trade).	\$28 (Rs. 46-14-5) =	Rs. 817-15-0 (= £54½).

Smoked:—

Mixed sizes	\$30 (Rs. 50-4-0) =	Rs. 844-6-0 (= £56½).

NOTE.—Exchange was at Rs. 167½ to \$100 and the picul is taken as 133⅓ lb.

Fourteen years ago Saville-Kent quoted the following rates as then ruling for the principal kinds exported from Australia and these may be usefully quoted here for comparison and reference.

Local name (Australia).	Value per ton.
Teat-fish, black and ordinary	£140 to £150
Do. White	40
Red-fish, ordinary and deep-water	100 to 110
Do. surf	80 to 90
Black-fish, deep-water	100
Do. ordinary and Caledonian ...	80 to 90
Large Lolly-fish	35
Prickly-fish or prickly-red	30 to 40
Sand-fish	20 to 30

It is most significant to note that the species with which we dealt last year and which sold at Rs. 1,013-4-0 and Rs. 817-15-0 (£67½ to £54½) per ton for large and small sizes respectively is

quoted in the above table (" Sand-fish ") at the much lower figures of £30 to £20 per ton, a difference due apparently to the more satisfactory treatment of the same class of raw material evolved in India.

As indicating the considerable importance of this industry on the Australian coast, we may note that the annual exports from Queensland, including re-exports of New Guinea produce between the years 1880 and 1889 (the only years for which I have statistics) ranged between 3,757 cwt., valued at £14,529 and 6,841 cwt., valued at £31,581; practically all of this went direct to China. For much of the material collected in Borneo and the Dutch Indies, Singapore is the clearing-house; in 1915, the imports of bêche-de-mer amounted to the exceptionally large quantity of 9,379 cwt., valued at $215,061. Practically all of this was re-exported to China.

From these figures it will be seen that the Indian and Ceylon production is at present a negligible proportion of the total consumption and that we need have no fear of ever experiencing any difficulties in disposing of our production, however greatly we may expand the industry.

As I believe the trade ramifications of this industry are very little known, I append (Tables I, II, III and IV) tabulated statistics of the imports into and exports from Penang and Singapore, of bêche-de-mer, for the past ten years. From these, several interesting facts emerge. We see that Borneo and the Philippines between them produce nearly 50 per cent of the total imports into Singapore on an average of ten years, while in some seasons fully three-fourths of the total comes from these islands. South Africa is a late comer into the trade, her exports beginning in 1915. The large imports into Singapore from Hongkong and China in some years are puzzling and seem larger than local consumption can require. It is to be noted that Ceylon produce goes almost entirely to Penang for sale and that no exports to that port have taken place since 1914, a fact largely due, I believe, to deterioration in methods. (Information recently received shows that the methods pursued by some important curers in Ceylon are even worse than those formerly practised in India—the material is sometimes boiled once only, the limy coating imperfectly removed and the material dried on the sand without mats.)

The variations in the values placed by the Ceylon exporters upon their produce are remarkable and appear to indicate that the rates given bear in some years little or no relation to the real market value of the produce.

The tables given are compiled from statistics kindly supplied by the Registrars of Imports and Exports of Singapore and Penang to whom I am greatly indebted for this courtesy.

THE PROSPECTS OF THE INDUSTRY IN INDIA.

We have already seen that the Chinese market will absorb all we can possibly produce, and that the only limitations are those of the natural supply in our littoral waters.

I have not as yet been able to examine that part of the northern half of Palk Bay and Strait which from its depth and probable faunistic conditions is likely to be productive of the only valuable species at present available, but so far as the southern half is concerned I have located the chief beds. These lie principally in the south-west angle, where large areas of sandy bottom are found, extending from Tirupalakudi in the north to Pillaimadam and Mandapam in the south-east. This appears to be the richest ground as on several occasions over 10,000 of these animals have been collected in a single day by a small diving force varying between 23 and 31 men.

Another centre is Pamban where a good deal of white attai is obtained by diving and by wading over the sand-flats at low tide. Rameswaram Bay has also yielded sufficient to keep a small factory busy in former years but at present the divers report a scarcity of material there. White attai is also met with, but generally in small quantities, in depths of 1 to 3 fathoms in the inner passage between the mainland and the Ramnad and Tinnevelly Islands as far south as Tuticorin.

At present the Government factory at Tirupalakudi is the only one in operation. The small private concern at Pamban closed down last year, and this locality may be worth attention when the Krusadai Island Station be built, as a curing station could then be supervised with a minimum of trouble and expense. In the meanwhile the most likely situation for a second station is Vedalai, where is located a small community of divers already working in the Government Chank Fishery. It has to be borne in mind that under present conditions the bêche-de-mer fishery is not sufficiently

remunerative to induce divers to devote their whole time to it; it has to be worked as an auxiliary to the chank fishery, and as already explained the conjunction is a welcome one to the divers.

Any large increase in the industry in any locality where the animals are fairly abundant, will depend chiefly upon whether any substantial increase in the rates paid, can be given. Last year very low rates prevailed as the cost of preparation had to be ascertained, and the general impression among the coast people was that the market was abnormally low. Accordingly the divers agreed to meet Government in this situation by accepting considerably lower rates than prevailed when the trade was flourishing. The prices agreed upon were Rs. 10–6–8 per 1,000 for No. I quality, Rs. 5–3–4 per 1,000 for No. II and Rs. 1–11–9 for No. III.

With the favourable experience of last year as a guide and according to my promise to the divers, the rates fixed for this year's transactions have been increased to Rs. 6–8–2 in the case of the larger grades (Nos. I and II which are now to be treated as a single grade), and to Rs. 2–9–8 per 1,000 in that of the smaller size (No. III) to which it is necessary to give special encouragement. If the results of the present season's work again show a large margin of net profit, it will be necessary to consider what further increase can be given in the following year, as every enhancement of the rate will make the divers more willing to devote increased attention to this section of their work, and with larger catches, the cost of curing, etc., will be reduced and the turn-over much augmented. It will also tend to attract a larger number of divers and this will not only benefit the bêche-de-mer fishery but will prove of much value in assisting recruitment for the chank fishery.

Black attai *(Holothuria atra)* is exceedingly abundant and although it is reputed to have been used occasionally to adulterate and colour parcels of white attai, it does not appear to have been fished specifically for its own sake.

Accordingly I instituted a number of experiments and found that while there is no difficulty in curing this species, the weight of the dried product is so insignificant (approximately half that of average No. III grade of white attai) and its quality is considered so poor by the Chinese, that the price quoted in Singapore for the sample sent, about Rs. 7 per picul, makes it impossible to cure this species at a profit.

In regard to white attai, evisceration prior to boiling while desirable is not absolutely necessary; in the case of the black kind it is essential because whereas the former eviscerate through the vent during the boiling process, the black ones if not eviscerated by slitting open, burst irregularly midway along their length, eviscerate through this opening and end by drying in contorted and ugly shapes. If slit open for a short distance from the posterior end, the viscera come out freely and when subsequently boiled the animal does not contort, but remains straight and natural looking.

The only localities on the mainland of India where commercial kinds of bêche-de-mer are available or can be fished are Palk Bay and the south Ramnad coast. On the Malabar coast the bottom is too muddy, while on the Coromandel coast the absence of a diving element in the fisher population would prohibit it, even were bêche-de-mer to occur in quantity there, a point not at present ascertained.

But if the prolific mainland area be restricted, there is considerable prospect of the insular region of the Laccadives proving worth attention and exploitation. When I was at Kiltan atoll in 1908, I found the islanders preparing small quantities and judging from this fact and by analogy in regard to the faunistic character of the great reef-flats of Bitra, Cherbaniani, Perumal and Byramgore with Polynesian reefs where bêche-de-mer is very abundant, it is desirable that Government should take an early opporunity of having this region explored thoroughly by officers of the Fisheries Department with a view to test the potentialities of this archipelago in regard not only to general fishing development and to this product in particular, but also in respect of mother-of-pearl-producing shells as green snail (*Turbo*), trocas (*Trochus*), and even the true pearl-oysters (*Margaritifera* spp.).

As the method employed in the Laccadives is different from that followed in Palk Bay and Ceylon, it will be useful to put the particulars on record of what I learnt during my visit to the islands in 1908. So far as I could learn the industry had then but recently been introduced. I was informed indeed that it had been brought to the attention of the islanders only three years before by a Cannanore Mappilla who stayed in the island for some time supervising the collection and curing of the product. As taught by this man the process is carried on as follows.

Each holothurian is first slit open longitudinally and the viscera removed; the thick fleshy body-wall remaining is washed in sea water and then boiled for about half an hour. As in the Palk Bay curing operations, the time when the material should be removed from the cauldron is judged by the odour given out. After removal from the boiler the pieces are pinned open by the insertion of short wooden skewers in order to prevent curling, and are then exposed for drying to the full glare of the sun upon a cadjan platform raised 2½ feet from the ground. When dried thoroughly they are stored till enough be accumulated to send to Mangalore. The price received from the middlemen of the latter port was reported to be from Rs. 3 to Rs. 5 per tolam of 28 lb., equivalent to Rs. 240 to Rs. 400 per ton, far too low a price if the quality of the product approaches that produced by like-circumstanced coral atolls in the Pacific, as I have little doubt is the case.

The species of bêche-de-mer available in quantity at Kiltan are three:—(*a*) *Vella kōkā*, mottled grey and dirty brown, (*b*) *Karrta kōkā*, black in colour, and (*c*) *Soganna kōkā*, of reddish-brown hue. The animals are collected by wading in the lagoon and on the reef-flat at low tide and also by spearing from boats.

At Androth, I noticed abundance of large holothurians in the shallows, but here no curing is carried on, as the elders of this particular island are strongly opposed to any development of such an industry from religious or rather from superstitious reasons. A venerated mullah now deceased had fulminated against any traffic in such scaleless inhabitants of the sea, and had banned with threat of misfortune any who should take it up, a prophecy which, I was told, duly came true in several instances. Hence although the people admit that the trade can be made to give a good return they will have nothing to do with it. This attitude need not hamper any prospective attempt to develop a large trade in the islands, as it is only the inhabitants of Androth who take up this attitude.

If steps be taken to extend the bêche-de-mer trade in the Laccadives, the result should be of considerable benefit to the islanders, for at present the industry is so restricted as to be of no commercial importance—the main sources of supply being untapped—while the prices obtained appear to be inadequate, the islanders being entirely at the mercy of the middlemen, who impose any rate they like to fix, trading as they do upon the islanders' ignorance of the true market value of the product.

SUMMARIZED RECAPITULATION.

The bêche-de-mer industry in India depends upon a single species, *Holothuria scabra*, called *vellai attai* (white leech) in Tamil. Two other species are abundant, the black and the prickly-green (*H. atra* and *Stichopus chloronotus*). The former is common on coral-reef flats, but has little commercial value as it shrinks to very small size and has little weight—less than half the weight of the poorest quality of *vellai attai*—when cured. The prickly-green species is too gelatinous to cure; and is found in fair quantities in Rameswaram Bay only.

The "white-fish" as we may call *H. scabra*, is akin to the "sand-fish" of Australian trade, where it is held in low esteem (Rs. 300 to Rs. 450 per ton) owing to the presence of a thick chalky coat on the exterior. In India this coating is removed by an ingenious and simple device and in consequence the product has ready sale and fetches good prices when well cured. No endeavour is made to remove the chalky layer in Australia and the Malay Archipelago, hence the introduction there of the Indian method should be of considerable benefit to the trade.

This industry in India is probably of considerable antiquity, introduced, improved, and periodically revived by immigrant Chinese curers.

The Chinese were careful and conscientious workers; they produced an excellent product and were prosperous till local men, chiefly Kilakarai Labbais, ousted them by boycott. The local curers invariably allowed their methods to deteriorate after a few years, with the result that the market value of the produce became unremunerative and the trade lanquished and died out until again revived by the advent of another Chinese curer who reorganized methods and re-established the reputation of the Indian product.

The Customs statistics show that in the twelve years from 1898 to 1910 the average annual export of bêche-de-mer was 12,175 lb.; during the ensuing six years the annual export fell to an average of 2,991 lb. only. In 1915 the industry had virtually died out. The trade was in one of its periodical collapses in 1914–15 when first investigated.

Many abuses were found to have crept into the curing methods, the chief being (*a*) faulty evisceration, (*b*) imperfect removal of the chalky external coat, (*c*) careless and dirty sun-drying, (*d*) imperfect

sterilization by smoking, (*e*) too prolonged storage, (*f*) trickery in mixing inferior stuff with good.

To attempt a revival of the industry and thereby to increase the earnings of the local chank divers, the Madras Government in G.O. No. 2739, Revenue, dated 9th December 1915, authorized the establishment of a bêche-de-mer curing station at Tirupalakudi on the south-west coast of Palk Bay. Work was commenced in August 1916 and the first parcel of cured material was shipped to Singapore in the following December. The quality was found so satisfactory that it sold at the following high rates:—

Unsmoked:—

	RS.	A.	P.		
Large and medium sizes ...	1,013	4	0	(£67½)	per ton.
Small size	817	15	0	(£54½)	,,

Smoked:—

	RS.	A.	P.		
Mixed sizes	844	6	0	(£56)	,,

After allowing for depreciation of buildings and plant, together with supervision charges, the net profit on the first half season's work was equal to over 63% upon the expenditure, a rate which has justified a substantial increase in the rates now being paid to the fishermen. The curing methods at present in operation are as follows:—

(*a*) Thorough evisceration before or during boiling.

(*b*) Boiling without the addition of water till the animals shrink to half their length and emit a distinctive odour (40 to 50 minutes from time of applying heat to the pans).

(*c*) Burial under damp sand for 12 to 18 hours.

(*d*) Removal of the chalky external coat, first by hand manipulation and then by foot trampling in a basket.

(*e*) A second boiling for 20 minutes; this time sea water sufficient to cover is added.

(*f*) Either full drying upon wire-net trays raised above the ground or half sun drying and then finishing off in a smoke-house. In the latter case the product should become very dark red in colour.

Constant care has to be maintained to keep the material thoroughly dry during storage by means of occasional re-exposure to sunshine.

The best markets for Indian produce are Singapore and Penang, shipment being made by mail steamer from Negapatam. No

shipment should be made during the rainy season, lest the material get wet or damp on the journey.

Unsmoked sun-dried bêche-de-mer is preferred for local consumption in the Straits Settlements; for re-export to China, the better keeping smoke cure is required.

The only commercially workable areas producing bêche-de-mer off the Indian mainland appear to be the south-west angle of Palk Bay, the Pamban Pass neighbourhood and Rameswaram Bay. It is contemplated to open new curing stations as circumstances justify at Vedalai (near Mandapam), at Krusadai Island (Pamban), and possibly at Rameswaram.

The Laccadive Islands urgently require investigation as to their bêche-de-mer producing resources. Great reef-flats exist there which by analogy, faunistic and physical, with other reef areas in the Pacific, appear very promising. In 1908 the writer saw a small quantity of bêche-de-mer being dried in the island of Kiltan. Three species of commercial value were observed. The methods of cure adopted were different from those practised in Palk Bay; they approximated closely to those of Australia and Polynesia.

TUTICORIN,
28*th June* 1917.

JAMES HORNELL.

TABLE I.—Imports of Bêche-de-mer into Singapore for the years 1907 to 1916.

—	1907.		1908.		1909.		1910.		1911.		1912.	
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$
Aden	72	1,070	176	1,008	22	162	...	...	30	300	280	2,200
Mauritius	82	1,850	141	2,364	180	2,800	143	2,370	154	4,268	43	861
Union of South Africa ...	...	...	...		...	...	...	...	...	...	...	...
Bombay	...	...	47	614	...	..	...	...	...	...	..	...
Calcutta	...		...	...	...	...	...		...	...	72	1,072
Burma	50	1,700	71	1,720	...	...	...	...	...	...	2	140
Madras	40	560	80	1,086	...	...	...	..	...	...	...	...
Ceylon	...	...	...	...	..		31	630	...	...	...	...
Tringganu	9	450	2	40	...	...	...		1	20	1	19
British North Borneo ...	960	32,478	418	13,042	564	15,789	365	9,286	907	28,384	680	24,216
Hongkong	312	10,932	737	11,955	277	6,528	30	600	25	570	20	230
Australia	940	19,411	111	3,412	3	126	58	1,318	4	80	28	560
Straits ports	177	6,223	296	6,865	107	1,887	59	1,377	...	...	47	1,530
Other British possessions...	40	810	...	...	...	...	...	...		...	...	...
France	200	1,600	30	300	...	...	...	.	...	...	...	...
Egypt	75	1,475	..	...	...	...	...	...	...	...	...	..
Sumatra	284	12,136	178	6,568	228	5,930	238	9,531	374	12,463	184	7,241
Java	154	4,130	141	4,406	53	1,345	38	735	54	1,530	48	2,195
Celebes	1,682	44,818	547	21,830	700	23,805	582	14,883	653	19,997	749	24,629
Moluccas	...	..	33	1,000	42	1,320	168	5,339	154	2,462	184	4,108
Natunas and Anambas Islands.	13	360	18	415	7	235	9	250	82	2,973	25	560
Dutch Borneo	357	7,967	164	3,017	529	11,484	1,118	23,879	777	17,923	376	9,808
Bali and Lombok	123	3,661	55	1,165	17	310	6	183	196	4,094	193	4,985
Other Dutch Islands ...	870	37,627	1,203	58,535	476	21,045	550	18,216	261	13,703	321	14,178
Philippines and Sulu Archipelago.	1,077	21,975	656	12,075	903	14,764	980	16,739	1,774	31,425	1,421	29,097
Siam	...	...	...	.	...	...	2	44	3	72	..	...
French Indo-China ...	...	...	...	...	...	...	4	80	29	737	26	451
German New Guinea ...	31	465	95	706	30	700	24	520	87	1,720	...	...
China	...	..	...	...	26	1,140	13	220	...	...	8	334
Japan	3		..	..	1	80	5	290	1	100	5	333
Other Foreign Countries ...	...	..	45	320	246	8,240	170	8,500	...	...	24	900
Total ...	7,551	211,994	5,244	152,443	4,411	117,690	4,593	114,990	5,566	142,821	4,737	129,647

Values in Straits dollars.

TABLE I.—Imports of Bêche-de-mer into Singapore for the years 1907 to 1916—*cont.*

—	1913.		1914.		1915.		1916.		Annual average.		Average rate per picul in $.	Average rate per picul in rupees, etc. 1 $ = Rs. 1-12-0.
	Quantities. (14)	Values. (15)	Quantities. (16)	Values. (17)	Quantities. (18)	Values. (19)	Quantities. (20)	Values. (21)	Quantities. (22)	Values. (23)	(24)	(25)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$		RS. A. P.
Aden	1,590	11,866	138	1,300	...	...	...	...	230·8	1,790·6	7·7	13 7 7
Mauritius	54	650	140	2,512	245	4,125	218	3,055	140·0	2,485·5	17·7	30 15 7
Union of South Africa	...	...	...	...	669	11,035	140	2,820	404·5	6,927·5	17·1	29 14 9
Bombay	200	1,600	...	...					(Over 2 years.)			
Calcutta	...	...	...	...								
Burma	...	...	...	...	182	3,640	...	...	74·4	1,213·2	16·3	28 8 4
Madras	..		...	.								
Ceylon	...	...	...	...	...	...	...	...	3·1	63·0	20·3	35 8 4
Tringganu	1	26	10	237	...	...	4	200	2·8	99·2	35·4	61 15 2
British North Borneo ...	567	22,269	515	18,527	963	31,595	875	34,942	681·4	23,052·8	33·8	59 2 4
Hongkong	116	2,655	58	1,200	...	...	97	3,280	167·2	3,795·0	22·6	39 8 9
Australia	60	973	37	814	...	...	109	5,755	135·0	3,244·9	24·0	42 0 0
Straits ports	105	3,375	197	6,265	196	6,385	113	3,325	129·7	3,723·2	28·7	50 3 7
Other British possessions ...	...	...	15	324	288	3,601	...	..	34·3	473·5	13·8	24 2 4
France ...	...		..	..	...	...	..	...	23·0	190·0	8·2	14 5 7
Egypt	...	...	6	50	..	...	...	...	8·1	152·5	18·8	32 14 4
Sumatra	286	12,574	216	11,169	279	11,141	301	10,958	256·8	9,971·1	38·8	67 14 4
Java	16	510	31	1,201	.	...	40	1,406	57·5	1,745·8	30·3	53 0 4
Celebes	569	20,656	166	7,584			122	5,805				
Moluccas	122	5,220	147	6,461	320	14,741	393	16,401	733·3	24,105·9	32·8	57 6 4
Natunas and Anambas Islands.	62	2,410	20	770	...	...	160	4,531	39·6	1,250·4	31·5	55 2 0
Dutch Borneo	435	8,746	419	8,907	828	16,590	1,961	37,532	696·4	14,585·3	20·9	36 9 2
Bali and Lombok	72	1,965	34	785	95	2,541	81	2,650	87·2	2,233·9	25·6	44 12 9
Other Dutch Islands ...	374	15,626	265	12,610	659	25,232	368	15,175	534·7	23,194·7	43·3	75 12 4
Philippines and Sulu Archipelago.	1,494	33,107	2,238	46,592	4,651	84,265	1,567	29,484	1,676·1	31,952·3	19·0	33 4 0
Siam	...	...	35	605	...	...	...	...	4·0	72·1	18·0	31 8 0
French Indo-China ...	34	549	18	288	...	...	22	330	13·3	243·5	18·3	32 0 4
German New Guinea ...	...	..	85	1,200	...	...	...	..	44·0	663·8	15·0	26 4 0
									(Over 8 years.)			
China	...	...	31	765	...	..	4	320	8.2	277·9	33·8	59 2 4
Japan	14	712	3	120	...	..	13	1,150	4·5	308·1	68·4	119 11 2
Other Foreign Countries ...	...	...	15	1,050	4	170	..	...	50·4	1,918·0	38·0	66 8 0
Total ...	6,171	145,489	4,839	131,336	9,379	215,061	6,588	179,119	5,907·9	154,059·0	26·0	45 8 0

TABLE II.—Imports of Bêche-de-mer into Penang for the years 1907 to 1916.

—	1907.		1908.		1909.		1910.		1911.		1912.	
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$
Aden	...	...	46	800	356	3,587	...	...	..	...	...	...
India	50	800	...	...	...	...	...	...	50	840	...	..
Burma	143	4,724	172	6,217	107	4,356	216	10,489	238	14,662	69	3,363
Ceylon	218	9,300	450	10,500	115	2,760	58	550	..	...	170	2,250
Hongkong ...	19	1,500	26	2,373	27	2,109	72	4,221	41	4,305	17	2,120
Australia ...	...	...	...	...	...	...	...	...	..	...	...	...
Kedah	...	...	..	...	...	...	...	...	17	1,030	...	...
Straits ports ...	...	...	296	6,865	41	1,659	30	1,785	159	6,648	336	16,243
Other British possessions.	...	...	...	...	...	...	...	...	...	..	...	...
Sumatra	31	857	13	351	3	85	17	567	63	1,893	63	2,751
Dutch Islands ...	...	...	...	...	...	...	...	...	...	...	...	...
Siam (West Coast).	106	3,281	128	5,139	46	2,341	27	1,547	135	7,750	109	5,632
Japan	...	...	...	...	9	740	...	...	2½	190	6	410
Other Foreign Countries.	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	567	20,462	1,131	32,245	704	17,637	420	19,159	705½	37,318	770	32,769

TABLE II.—Imports of Bêche-de-mer into Penang for the years 1907 to 1916—*cont.*

—	1913. Quantities. (14)	1913. Values. (15)	1914. Quantities. (16)	1914. Values. (17)	1915. Quantities. (18)	1915. Values. (19)	1916. Quantities. (20)	1916. Values. (21)	Annual average. Quantities. (22)	Annual average. Values. (23)	Average rate per picul in \$. (24)	Average rate per picul in rupees, etc. 1 \$ = Rs. 1-12-0. (25)
	PICULS.	\$	PICULS.	\$	PICULS.	\$	PICULS.	\$	PICULS.	\$		RS. A. P.
Aden	...	...	...	...	...	...	...	.	40·2	438·7	10·9	19 1 2
India	339	6,680	247	7,780	439	13,076	743	25,741	312·1	10,709·0	34·3	60 0 4
Burma	148	4,880	160	3,482								
Ceylon	156	6,249	...	...	...	..	.	...	116·7	3,160·9	27·0	47 4 0
Hongkong ...	29	2,769	23	2,183	27	2,344	76	4,652	35·7	2,857·6	80·0	140 0 0
Australia ...	...	...	...		173	3,914	..	...	17·3	391·4	22·6	39 8 9
Kedah	4	100	...	...	..	...	..	...	2·1	113·0	53·8	94 2 4
Straits ports	204	6,808	104	3,023	62	1,533	67	1,855	129·9	4,641·9	35·7	62 7 7
Other British possessions.	...	...	...	...	...	...	9	177	·9	17·7	19·6	34 4 9
Sumatra	41	2,382	55	2,628	..	...	220	5,871	50·6	1,738·5	34·3	60 0 4
Dutch Islands ...	...	...	...	...	23	733	...		2·3	73·3	31·8	55 10 4
Siam (West Coast).	105	3,276	14	256	61	2,021	143	3,466	87·4	3,470·9	39·7	69 7 7
Japan	...	...	4	340	...	...	.	...	2·15	168·0	80·0	140 0 0
Other Foreign Countries.	...	...	..	...	9	175	8	484	1·7	65·9	38·7	67 11 7
Total ...	1,026	33,144	607	19,692	794	23,796	1,266	42,246	799·05	27,846·8	34·8	60 14 4

TABLE III.—Exports of Bêche-de-mer from Singapore for the years 1907 to 1916.

—	1907.		1908.		1909.		1910.		1911.		1912.	
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Piculs.	$	Piculs.	$	Piculs.	$	Piculs.	$	Piculs.	$	Piculs.	$
Burma	...	...	...	...	...	...	...	...	5½	330	7	361
Perak	...	...	...	...	4	138	...	..	2	40	4	130
Selangor ...	11	88	28	956	26	606	6	134	40	658	36	558
Sarawak ...	...	...	⅕	15	8	600	2	140	3	190	...	..
Hongkong ...	7,214	315,882	5,016	201,161	2,564	76,182	2,553	77,996	2,559	80,151	2,865	102,217
Straits ports	92	991	9½	337	...	...	18	740	162	2,654	178	1,720
Other British possessions.	...	...	4	101	...	...	¼	16	...	...	...	...
Sumatra ...	1	40	..	...	2	129	1	80	1	30		...
Java	5	288	2½	70	1	20	1	35	2	105	...	...
Dutch Borneo ...	...	...	...	..	1	20	1	65	..	..	...	...
Other Dutch Islands.	...	...	17	850	...	...	3	120	...	...	...	...
Siam	2	120	5	290	...	...	2	120	14	880	2	80
China	2,764	124,693	2,461	109,729	2,220	76,655	2,384	80,997	2,586	87,332	2,544	81,740
Other Foreign Countries.	...	...	...	...	...	...	...	...	..	...	...	...
Total .	10,089	442,102	7,543·2	313,509	4,826	154,350	4,971·25	160,443	5,374·5	172,370	5,636	186,806

TABLE III.—Exports of Bêche-de-mer from Singapore for the years 1907 to 1916—*cont.*

—	1913.		1914.		1915.		1916.		Annual average.		Average rate per picul in $.	Average rate per picul in rupees, etc. 1 $ = Rs. 1-12-0.
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.		
	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$		RS. A. P.
Burma	...	...	2	140	...		2	200	1·65	103·1	62·4	109 3 2
Perak	10	146	2	64	...	...	1	20	2·3	53·8	23·3	40 12 4
Selangor ...	14	216	8	80	...	...	3	100	17·2	339·6	19·7	34 7 7
Sarawak ...	...	...	6	220	...	...	3	87	2·22	125·2	56·3	98 8 4
Hongkong ...	1,900	61,200	1,586	56,120	3,521	119,881	2,232	77,547	3,201·	116,833 7	36·4	63 11 2
Straits ports ...	119	1,324	179	2,671	62	1,533	67	1,865	88·65	1,383·5	15·6	27 4 9
Other British possessions.	2	172	...	...	2	150	6	236	1·4	65·9	47·	82 4 0
Sumatra ...	5	145	4	71	...	...	...	...	1·4	49·5	35·3	61 12 4
Java	...	...	76	1,110	...	...	...	...	8·75	162·8	18·6	32 8 9
Dutch Borneo ...	5	150	...	...	...	...	...	...	·7	23·5	33·5	58 10 0
Other Dutch Islands.	..	...	...	...	...	...	...	...	2·	97·	48·5	84 14 0
Siam	...	...	10	310	...	...	5	380	4·	218·	54·5	95 6 0
China	2.538	91,552	2,583	116,525	5,979	159,896	3,205	156,868	2,926·4	108,598·7	37·1	64 14 9
Other Foreign Countries.	...	...	...	...	3	180	...	...	·3	18·	60·	105 0 0
Total ...	4,593	154,905	4,456	177,311	9,567	281,640	5,524	237,303	6,257·995	228,073·9	36·4	63 11 2

TABLE IV.—Exports of Bêche-de-mer from Penang for the years 1907 to 1916.

—	1907.		1908.		1909.		1910.		1911.		1912.	
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$
India ...	...	...	...	...	..	...	8	410	..	...	...	...
Burma	7	700	19	1,800	9	673	4	230	16	1,030	24	877
Hongkong ...	591	21,909	1,620	48,485	1,764	54,020	632	20,350	430	16,330	582	21,650
Federated Malay States.	...	...	...	...	19	892	10	369	16	1,198	10	564
Straits ports ...	3	60	159	5,906	292	12,885	253	13,839	455	22,756	45	2,254
Other British possessions.	...	...	...	...	...	...	1	30	..	...	...	...
Sumatra	...	...	2	130	5	215	11	692	...	...	2	165
Siam (West Coast).	2	86	...	...	...	...	...	...	...	...	...	...
China	1	40	...	.	131	6,498	...	...	...	...	...	...
Total ...	604	22,795	1,800	56,321	2,220	75,183	919	35,920	917	41,314	663	25,510

TABLE IV.—Exports of Bêche-de-mer from Penang for the years 1907 to 1916—*cont.*

—	1913.		1914.		1915.		1916.		Annual average.		Average rate per picul in $.	Average rate per picul in rupees, etc. 1 $ = Rs. 1-12-0.
	Quantities. (14)	Values. (15)	Quantities. (16)	Values. (17)	Quantities. (18)	Values. (19)	Quantities. (20)	Values. (21)	Quantities. (22)	Values. (23)	(24)	(25)
	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$	PICULS.	$		RS. A. P.
India	...	...	..	...	...	...	...	...	·8	41·0	51·2	89 9 7
Burma	20	572	19	342	...	...	...	...	11·8	622·4	52·7	92 3 7
Hongkong ...	695	23,519	205	9,000	456	14,245	641	25,840	761·6	25,534·8	33·5	58 10 0
Federated Malay States.	...	...	...	...	...	...	...	...	5·5	302·3	54·9	96 1 2
Straits ports ...	116	4,961	145	3,475	256	7,103	110	3,205	183·4	7,644·4	41·6	72 12 9
Other British possessions.	2	150	...	...	10	672	13	380	2·6	123·2	47·3	82 12 4
Sumatra	2	79	2	102	..	...	...	.	2·4	138·3	57·6	100 12 9
Siam (West Coast).	1	50	...	...	...	...	...	...	·3	13·6	45·3	79 4 4
China	6	180	...	...	...	...	...	...	13·8	671·8	48·6	85 0 9
Total ...	842	29,511	371	12,919	722	22,020	764	29,425	982·2	35,091·8	35·7	62 7 7

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